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EDITORIAL.

"My son, list to my precepts, neglect none of my injunctions. Set my admonitions before thine eyes: thus shalt thou prosper and prolong thy days in pleasantness.

"I have honored thee by providing an extensive library for thy use, and have thus relieved thee of the necessity to borrow books. Most students must bustle about to seek books, often without finding them. But thou, thanks to God, lendest and borrowest not. Of many books indeed thou ownest two or three copies. I have made besides for thee books on all sciences, hoping that thy hand might find them all as a nest. Remember the words of Ben Mishle:

" 'He who has toiled and has bought for himself books but his heart is empty of what they contain, is like a man who engraveth on a wall the figure of a foot, and trieth in vain to stand.' "

Possibly in medical studies more so than in others the extreme price and number of text-books makes lending and borrowing a necessity. Those of us who are dependent on the generosity of our friends and libraries might well heed these words taken from the Ethical Will of Dr. Judah Ibu Tibbon, written in Granada, Spain, 1190 A.D.

Tibbon was a prosperous physician practising in Lunel, France, and was influential in transplanting Arabian Medicine and Philosophy into Europe. He was a great collector of books, and

this testament was written for his son, Dr. Samuel Tibbon. From the original text in Hebrew the document has been translated and some of the medical references which we think are particularly applicable to medical students follow:

"Make thy books thy companions; let thy cases and shelves be thy pleasure-grounds and gardens. Bask in their paradise, gather their fruit, pluck their spices and their myrrh. If thy soul be satiate and weary, change from garden to garden, from furrow to furrow, from prospect to prospect. Then will thy desire renew itself and thy soul be filled with delight. Remember what Ben Mishle says:

" 'The wise of heart forsakes the ease
of pleasure;
In reading books he finds tranquility.'

"Very important it is that thou shouldst fufil my commands regarding thy diet. Experience has taught thee how much thou hast suffered in this regard. Be content with little and good and beware of hurtful sweets. Eat no eating that prevents thee from eating. Art thou not ashamed before thyself and the world when all know that thou art periodically sick because of thy injurious diet? There is no more disgraceful object than a sick physician. Who shall, forsooth, mend others when he cannot mend himself?

"Devote thy mind to thy children. Be not indifferent to any slight ailment in them or in thyself, but if thou dost notice any suspicion of disease in thee or in one of thy limbs, do forthwith what is necessary in the case. As Hippocrates has said: "Time is short and experiment dangerous; therefore, be prompt and apply a sure remedy, avoiding doubtful treatment."

"As to your library, examine thy Hebrew books at every new moon, the Arabic volumes once in two months, and the bound codices every quarter. Arrange thy library in fair order, so as to avoid wearying thysef in searching for the book thou needest. Always know the case and chest where the book should be.

"Never refuse to lend books to anyone who has not the means to purchase books for himself, but only act thus to those who can be trusted to return the volumes. Take particular care of thy books.

"Cover thy books with rugs of fine quality, and preserve them from damp and mice and from all measure of injury, for thy books are thy good treasure. If thou lendest a volume, make a memorandum before it leaves thy house, and when it is returned, draw thy pen over the entry. Every Passover and Tabernacles call in all books out on loan.

"Thou art still young and improvement is possible if heaven but grant thee the helping gift of desire and resolution, for ability is of no avail without inclination. 'A green tree whilst still moist thou canst straighten, but thou canst not straighten a dry log.' Exert thyself whilst still young, the more so as even now thou complainest of weak memory. What wilt thou do in old age, the mother of forgetfulness."

On page 108 in this number, you will find a new department which will, we expect, meet a need expressed in several letters to the editor.

We are devoting a page to the mention of books of broader interest to the medical student than his ubiquitous text. We do not wish to attempt a critique of these books, leaving that to the more competent professional reviewers of the daily and weekly press. Nor do we wish to be dogmatic or pedantic. It is our only hope that we may be of some use to the student in bringing to his attention each month a few books that have pleased us, and that he may find somewhat of the same pleasure in their perusal. Suggestions regarding the conduct or the content of this department will be welcomed.

Acute Empyema.

By R. M. JANES, M.B.

Previous to the World War it would appear to have become accepted that infection of the pleural cavity called for immediate drainage as did infection elsewhere. The patient with pneumonia, who developed a purulent pleurism, was immediately transferred to the care of the surgeon and subjected to operation under general anaesthesia and open drainage of the pleural cavity. This was done without regard to the state of the lung or to other manifestations of the infection from which the patient was suffering. If the empyema had complicated lobar pneumonia, and was due, therefore, to the pneumococcus and rarely recognized until after the crisis, the patient did well. If, on the other hand, the pleural infection complicated a bronchopneumonia the result was frequently disastrous. It was only during the influenza epidemic when these cases presented themselves in large numbers, that the appalling mortality following this method of treatment was forced upon the attention of attending physicians and surgeons. A more rational method of treatment based upon physiological and pathological principles was the result.

Infection of the pleural cavity may complicate a blood stream infection, may follow pneumonia, lung abscess or subphrenic abscess and may result from puncture of the chest wall. Infection by way of the blood stream would appear to be rare and it is difficult to be certain in any given case that some infection of the lung did not precede the condition. Infection through puncture wounds is rare in civil life.

Bacteria may extend from the lung to the pleural cavity first, by way of lymphatics and second, through the rupture of a subpleural abscess. The lymphatic drainage of the peripheral one-centimetre of lung is toward the pleura, the remainder toward the hylus. Lobar pneumonia is an alveolar infection and it is probable that organisms from this type of lesion usually reach the pleura through the lymphatics. Abscess formation is rare. In bronchopneumonia the interstitial tissues are involved and the formation of small abscesses is common. The rupture of one of these abscesses situated immediately beneath the visceral pleura results in an empyema.

There is a certain amount of pleural effusion in almost every case of pneumonia. If organisms do not reach this fluid it is absorbed; if they do reach it a relatively widespread infection of the pleural cavity promptly occurs. There is likely to be one cavity only. If, on the other hand, adhesion of the pleura has occurred before organisms escape from the lung, a relatively localized infection occurs which gradually extends as the pressure which results from the formation of more and more pus, separates the pleural surfaces.

If organisms escape at more than one point more than one pus pocket results. This pathology is supported by the finding of different organisms in different pus pockets on the same side of the chest. Loculation of an empyema may also occur as a result of pleural adhesions subdividing an original cavity. In this case each pocket contains the same organism. Rupture of a gross lung abscess into the pleural cavity usually, though not always, results in the formation of a widespread empyema complicated by the presence of a bronchial fistula.

Empyema may be caused by any pathogenic organism, but the most common are the pneumococcus, streptococcus hemolyticus and staphylococcus aureus. The bacteriology of the lesion has a distinct bearing upon its progress

and treatment. The pneumococcus, because of its tendency to result in the outpouring of large amounts of fibrin, early produces a frankly purulent exudate which becomes localized by fibrinous adhesion of the visceral and parietal pleurae about the margins of the pus cavity. Streptococcus empyema on the other hand, may remain sero-purulent in character for days or even weeks without any localization. The reaction to staphylococcus comes midway between.

Lobar pneumonia is a disease of short duration. The presence of an empyema is not likely to be recognized until the inflammation within the lung has subsided. This together with the tendency of the pneumococcus to rapidly produce frank pus makes the management of this type of disease relatively simple. Broncho-pneumonia, on the other hand, resolves slowly. Inflammation and consolidation of the lung may persist for weeks. Infection of the pleural cavity may occur as early as the first day and frequently is present at the end of four or five days. Because of this one is called upon to treat an empyema in a patient who is still suffering from pneumonia.

The most important single factor in the early recognition of an empyema is constant watchfulness on the part of the attending physician. It is important to realize that, although fluid collections in the pleural cavity are found most frequently in the lower and posterior part of the chest, there is no absolute rule as to location. They may occur in any situation, including the interlobar fissures. Where ordinary chest findings leave doubt as to the presence of fluid, the X-day is of great value. This is particularly true in the presence of small localized pockets. The final diagnosis must depend always upon chest puncture. While it cannot be denied that there is some danger from pleural shock in aspiration of the chest, this should never deter one in the presence of real suspicion of an empyema. The danger is, after all, slight.

Treatment.

There are three methods of dealing with collections of pus in the pleural cavity: (1) aspiration, (2) closed drainage, and (3) open drainage either by an intercostal incision or rib resection. All of these methods have their place. In deciding upon the course to be followed one should consider the state of the underlying lung, the character of the fluid and the general condition of the patient.

Aspiration should be regarded as palliative only, since it so rarely results in cure. Since, however, it permits of carrying the patient over the danger stage it may be a life-saving procedure. Its routine use in American hospitals during the influenza epidemic of 1918 resulted in the reduction of a mortality of 40-80% to a mortality of as low as 4% in certain hospitals. The amount of absorption of toxins from an empyema cavity, as in the case of similar collections elsewhere, depends upon the extent of the cavity and upon the pressure on the containing walls. Aspiration, in the majority of cases, controls this absorption as well as more radical procedures. Repeated aspiration should be carried out until the pneumonia has subsided or until the fluid has become frankly purulent and therefore probably localized by fibrinous adhesions. It should be repeated, as a rule, every second to fourth day, depending upon the temperature and pulse reactions. If properly carried out under local anaesthetic it should be an entirely painless operation and not, therefore, dreaded by the patient. There is no absolute rule as to the number of aspirations that should be carried out in a given case or the length of time that should elapse before more radical measures are adopted. It should not be continued too long else a thick-walled cavity may result which will be slow to heal, following adequate drainage. Certain cases, even in the presence of a thin exudate, are not controlled by aspiration alone. These should be treated by closed drainage.

Closed drainage may be established through an intercostal stab wound or following a rib resection, preferably the former. It is indicated when something more than aspiration has become necessary in a patient who is still suffering from pneumonia. This may occur when aspiration is failing to control the toxemia or when repetition of the procedure is proving anoying to the patient. It is of particular value in streptococcus empyemas since here the pneumonia persists for a long time and the fluid remains thin and unlocalized. It is a simple procedure which may be carried out under local anaesthesia either in bed or in the operating room with little, if any, greater disturbance than that produced by aspiration. Since it permits of the maintenance of continuous suction, it prevents collapse of the lung and the occurrence of a pneumothorax. It may therefore be carried out with safety even in the presence of a thin, unlocalized fluid and an unresolved pneumonia. The negative pressure may be maintained by simple syphon drainage set up by carrying a tube from the chest to beneath an antiseptic solution in a bottle tied to the side of the bed or more active negative pressure may be induced by the use of a sprengel pump or a water pump suction. If properly carried out, the system may be maintained airtight for from three to six weeks. Since the negative pressure within the pleura is normally 6 - 9 mms., strong suction is neither necessary nor desirable; it results in discomfort to the patient and in bleeding from the granulation tissue walls of the cavity.

The following is a simple and satisfactory technique. A wide area of chest wall is cleansed as for a major surgical operation. What is thought to be a point near the lower and anterior part of the fluid collection (if feasible between the mid-axillary and anterior axillary lines) is chosen for drainage. Drainage seems to have been equally efficient, when established here and the patient is not forced to lie upon a rubber tubing. With a very fine hypodermic needle an intradermal wheal of one half per cent. novocaine is introduced at the site chosen. A longer needle is now made to penetrate the wheal and is carried through the intercostal space slightly nearer its lower margin to give the intercostal nerve and vessels a wide berth. If a stream of novocaine is projected ahead of the needle no pain will be experienced. A fairly copious quantity of anaesthetic is introduced and great care taken to anaesthetize the pleura. With a fine scapel a small puncture is made in the centre of the intradermal wheal. This prevents the carrying of an impaled piece of skin into the chest and avoids the necessity for an uncomfortable amount of pressure. A large bore needle is introduced now, and sufficient pus aspirated to be certain that the cavity has been entered. If no pus is obtained the procedure must be repeated at another point, and under no circumstances should the chest be opened if pus has not been obtained. If pus has entered the syringe, a grooved director is passed along side the needle into the cavity and the needle withdrawn. Using the director as a guide, a rather wide-bladed scalpel is passed into the chest, the knife withdrawn and the director left in place. A drainage tube of good quality rubber and of about one-half inch bore should have been prepared previously by cementing two strips of old rubber glove to the tube several inches from its end. When the thickness of the chest wall has been ascertained the end of the tube is cut obliquely and at least one other opening made in its side to prevent plugging should the end of the tube come to lie against the lung. This end of the tube is grasped with a Kelly forceps while the other is placed beneath normal saline in a basin; the tube should never be clamped. It is forced well into the chest alongside the grooved director, which is then withdrawn. The patient should have been requested to refrain from coughing. The chest wall is now

dried with ether and the rubber strips fastened to it by overlapping strips of adhesive. A sprengel pump is attached or the end of the tube may be carried beneath the surface of an antiseptic solution contained in a bottle by the side of the bed.

Open drainage still remains the most popular and, on the whole, provided certain principles are observed, perhaps the most generally useful method of chest drainage. It should, apart from young children, be done invariably under local anaesthesia. If the local anaesthetic be placed properly, the operation should be entirely painless. The high mortality which attended its use was due to failure to recognize certain principles. It should never be done in the presence of thin, only slightly purulent collections or in the presence of pneumonia. Under these circumstances the lung is not bound to the chest wall by adhesions and therefore collapses immediately the chest is opened, leaving a cavity to the extent of the pleural space. This results in a wide area of absorption. If the patient still has an extensive pneumonia, the vital capacity may have been so reduced that only a sufficient air exchange was taking place, even with an increased respiratory rate. It may have been insufficient as evidenced by the presence of cyanosis. In the early empyema the mediastinum is not a fixed partition but is capable of considerable displacement. When open drainage is established the lung recedes from the chest wall because of the negative pressure induced by the elasticity of the uninvolved lung on the affected and unaffected side. This collapse of sound lung may so far reduce the vital capacity that extreme respiratory difficulty is brought about; the patient becomes cyanosed, great cardiac embarrassment is induced and the patient succumbs in the next few hours or days. The drainage opening should be placed near the lowest part of the cavity, usually in the region of the 9th or 10th rib, in the posterior axillary line. Too low a rib resection is unwise because of danger of penetrating the diaphragm. A resection below the 10th rib finally results in a long sinus between the diaphragm and the chest wall with less efficient drainage and greater danger of pocketing. If drainage must be established in an early empyema it should be invariably of the closed variety. If a double empyema is present it is better drained by the closed method. Pyopneumothorax, which results from rupture of a lung abscess and is complicated, therefore by a bronchial fistula, should be drained at once. This may be done by a closed drainage without suction—suction is, of course, useless because of the fistula—or by the open method.

In the treatment of the empyema two objects should be in view, first to save the life of the patient, and second, to prevent the occurrence of a chronic empyema. It the above mentioned principles are observed, the mortality rate should be extremely small. The occurrence of a chronic empyema is, as a rule, a reflection upon the efficiency of the treatment given. Whatever method of drainage is employed, it should be maintained until the last remnant of the cavity has been obliterated. The tube should actually be pushed out by the closing cavity. Few empyema cavities are obliterated in less than five or six weeks and many require a much longer time. Failure to control the fever or a return of fever indicates inefficient drainage or the presence of another unrecognized cavity. If a closed drainage has been used and it is thought at the end of a few weeks that drainage may be inefficient, there should be no hesitation in establishing what is known to be a satisfactory open drainage. The closed drainage will have enabled the patient to recover from pneumonia and will have served, therefore, its purpose.

Much difference of opinion exists as to the value of irrigation of empyema cavities with Dakin's solution. If used in early cases it tends frequently to

produce hemorrhage. It has not seemed of much value at this stage and sometimes definitely harmful. In later cases, especially those that are slow in clearing up, it is of definite value and its use frequently results in a rapid diminution in the size of the cavity. If the maximum benefit is to be obtained, the patient must be placed in such a position for the irrigations that the solution comes in contact with all parts of the cavity and remains in contact for a definite period.

Every patient should be under observation for from ten days to two weeks after final closure of the chest sinus and a record of the evening temperature kept in order that further pocketing of pus may be recognized and the sinus, if necessary, re-opened.

Summary.

In order to reduce the mortality from empyema to a minimum certain basic principles should be observed. Closed drainage if properly employed, is an ideal method of treatment but is only essential under certain conditions. Open drainage should never be done before definite adhesions have formed about a frankly purulent exudate. The patient should be under constant observation throughout the treatment in order that inefficient drainage or the presence of further collections of pus may be recignized. Chronic empyema should occur rarely and is usually a reflection upon the handling of the case.

The Active Principles of the Posterior Lobe of the Pituitary Body.

By W. J. HENDRY, B.A., 3T3.

Recently Oliver Kamm, T. B. Aldrich, T. W. Grote, L. W. Rowe and E. P. Bugbee (1) of the Parke Davis Company of Detroit, have succeeded in separating and obtaining in a comparatively pure state, two hormones from the posterior lobe of the pituitary body. In this article some of the properties of the separated principles will be discussed.

Work on the posterior lobe really began in 1898, following the discovery that the "pressor" effect was confined to the posterior lobe by Howell (2) and Schafer and Vincent. (3) Study of the three major responses elicited by the secretions of the gland, namely, (a) "Pressor," the raising of the blood pressure, (b) "Oxytoxcic," the sreng-thening and quickening of the uterine contractions in a rythmical manner, and (3) the diuretic-antediuretic effect.

A few words as to the method of separation of the hormones might not be amiss. Fresh beef pituitaries are dissected to sharply separate anterior and posterior lobes. The posterior lobes are dessicated with acetone and extracted with .25 per cent. acetic acid. The low molecular weight impurities are removed by salting out the protein with the hormones absorbed by sodium chloride or better, ammonium sulphate. The inert proteins are separated out by use of anhydrous acetic acid, and when 95 per cen. of the foreign proteins are removed, the principles can be precipitated out by suitable liquids—acetone, sulphuric ether, and finally petroleum ether.

The hormones, while differing in their physiological action are similar in their chemical and physical properties. Hence many fractinations must be conducted to secure a satisfactory separation. Following much fractination the separate fractions may be recombined, dissolved, and diluted back to the original volume yielding a solu-

tion indistinguishable from the original extract, thus showing that, in the process none of the activity has been injured or converted into another form. The following comparison of weights (in grams) may be of interest

Stage of Process.	Weight.
200 Beef Pituitaries	550
200 Posterior Lobes	50
Dessicated Posterior Lobes .	8
Purified Pressor Fraction ..	0.050
Purified Oxytocic Fraction .	0.015

The oxytocic activity is tested by measurement of the contractions of isolated uterine muscle of the guinea pig. The pressor activity is measured by increases in carotid blood pressure in dogs anaesthetised with chloroform, following injection of the extract into the great saphenous vein. The many details involved are described in Kamm's original paper, (1) and for the oxytocic effect we may refer also to the work of A. J. McLean of Harvard, which deals with the route of absorption of the hormones. (5)

In his research McLean partitioned his presumptive pituitrin from the sample of blood (or cerebro-spinal fluid) with which he was working, by dialysis, and tested by oxytocic titration and by the action of frogs' melanophores. The latter will be considered later. Working with canine, bovine and human blood, and cerebro-spinal fluid, the presumptive pituitrin was found to respond accurately to the methods of assay, was **not** histamine, and disappeared almost entirely after complete hypophysectomy. The concentrations in the internal jugular vein were higher than in any other place in the body. Then followed the arteries and the veins in the order named. The concentration in the cerebro-spinal fluid was in the same order as that in the arteries. Sequestration of the ventricles showed no change in concentration either in the blood or in the cerebro-spinal fluid. Despite a few anomalous findings, the evidence as a whole tended to favour a vascular rather than a trans-neural route of absorption.

We should now consider a few properties of the separate hormones. To study the action of Oxytocin and Vasopressin (as the oxytocic and pressor principles were named commercially) Bourne and Burn working under aseptic conditions, inserted into the uterus of an anaesthetised patient a small rubber bag on the end of a gum catheter when the os was moderately dilated. The bag was connected to a manometer by means of which the intrauterine pressure changes were recorded. The oxytocic hormone was injected into the buttock. In the case of a patient fifteen hours in labour, the pains were greatly augmented and rapidly associated with the second stage. Delivery occurred in 95 minutes and the placenta followed in ten minutes. In another case there was no pronounced effect. On the other hand, vasopressin produced no increase of the force or frequency of the contractions. Relaxation became slower, however, possibly due to spasm of the vessels leading to the uterus. Oxytocin is not affected by a large previous dose of vasopressin but a previous dose of oxytocin renders the uterus less susceptible to a subsequent dose. Shock does not accompany the administration of oxytocin as it does when whole pituitary extract is given.

The "pressor" principle owes its effects to its power of stimulating smooth muscle to contraction. By this means the blood pressure is raised and cramps, nausea and diarrhoea are produced when this stimulation acts upon the gastro-intestinal musculature. Some of the intense antidiuretic effect shown in Hjort's work is probably the result of spasm of the ureters. The stimulation of the flow of milk (galactogogue effect) comes under this head. There is no increased secretion in this case.

The next feature to consider is the renal activity of the separated princi-

ples. In their original work (1) Kamm and his associates noted a diuretic-antidiuretic effect following injection of the original extract. To determine which fraction possessed this property, rabbits were anaesthetised with urethane, a cannula inserted into the urinary bladder and the animal laid flat over the table with the cannula passing through a hole in the table. This avoids possible pocketing of the urine. The number of drops of urine flowing in a given time was then counted. The rabbits were fed on oats and greens, with plenty of water at hand. It was observed that the pressor fraction caused a marked increase in the flow of urine while the oxytocic produced a slight change only. This finding was confirmed by Draper, who noted the greater tendency of vasopressin to produce antidiuresis following initial diuresis. Bugbee and Simond, Parke Davis Company, Detroit, note that the diuretic - antidiuretic effect is confined almost exclusively to the pressor principle. Hemingway and Peterson of Cardiff disagree on the anti-diuretic action, claiming that both fractions have a prolonged action. They note also, an increase in the chloride concentration of the urine — often an increase in the total chloride excretion. Burn on the other hand claims that the anti-diuretic effect is entirely confined to vasopressin. At all events a subcutaneous injection of the aqueous extract will relieve temporarily the condition of diabetes (insipidus), no matter what its cause.

Throughout the work of Draper and of Bijlsms, Burn and Gaddum are suggestions of a third or renal hormone, more closely associated with the pressor than with the oxytocic activity. This might account for the great variance in the results of the investigators quoted above.

In unanaesthetised animals, the anti-diuretic is the important effect. Hjort at Dartmouth has experimented on human subjects and demonstrated the greater importance of the antidiuretic effect. The figures quoted in Leberman's paper also confirm this. This action may account for the good results obtained by Bomacorsi in his use of pituitrin (whole extract) in the alleviation of eneuresis.

Burn has shown that the power of preventing insulin hypoglycemia is possessed by vasopressin alone. This action is due partially to the liberation of adrenaline by vasopressin. The adrenalin breaks down the muscle glycogen which the insulin tends to build up. Vasopressin will act also on the liver liberating its glycogen as glucose.

Another interesting feature is the study of the action on frog melanophores (the pigment cells of the skin). Rowe sas shown, following bleaching of the frogs by bright light, that whereas the oxytocic principle has little or no effect, the pressor principle causes these cells to expand. The effect is more pronounced in decerebrate animals and is from 20 to 25 per cent. less than when an unseparated extract is used. This fact prompts Rowe to suggest a separate hormone. The action will take place in isolated pieces of skin, and also following paralysis of the cutaneous nerves.

Space has permitted us to touch upon only a few of the most interesting properties of the active principles of the posterior lobe of the pituitary body and to point out briefly the trend of modern research in this direction.

Summary.

1. Two active principles have been separated from the posterior lobe of the pituitary body.

2. A brief outline of the process of separation and method of testing is given.

3. The hormones are absorbed by a vascular rather than a trans-neural route.

4. A few of the properties of the hormones are discussed briefly.

5. Reference is made to suggestions of a third or renal hormone.

6. Reference is made to certain clinical results or uses to which the separated hormones, which are available commercially, may be put.

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The Pathology of the Pancreas in Diabetes Mellitus.

By E. H. BENSLEY, B.A., 3T0.

(Continued from last issue)

Lesions of the Pancreas Resulting From Diabetes.

(1) *Hydropic Degeneration of the Islets.*

This degenerative change in islet cells has been named "hydropic" because its chief characteristic is the replacement of the granular cytoplasm by a clear vacuole apparently consisting of a watery solution. This form of degeneration is confined to the beta cells, the alpha cells never suffering from the change. There appear in the cytoplasm small vacuoles which appear entirely transparent and colourless in contrast to the normal pale staining granular character of the cytoplasm. These vacuoles then become confluent and in the cell body are seen only the nucleus and a few pale staining isolated granules and threads, the rest of the cell body appearing quite homogeneous, transparent and colourless. Finally these granules and threads disappear and the nucleus is now surrounded only by a perfectly transparent and colourless material. At the same time swelling of the cell occurs and finally the cell bursts. As a rule, nuclear changes appear when the vacuolation of the cytoplasm has reached an advanced stage. The nucleus becomes very dense and shrunken and finally dissolves. It is the last part of the cell to disappear and indeed an apparently normal nucleus is sometimes seen naked, after the cell membrane has burst. The loss of cells is not accompanied or followed by fibrosis nor are visible gaps left. The acinar tissue seems to crowd in on all sides. Not even a leucocyte comes to devour the debris. Apparently the dissolving cells give off no irritating substance. The reduced island remains as a compact group of cells. Hydropic degeneration is the only form of islet destruction which is never accompanied by some degree of fibrosis.

This degenerative change has been found by Allen (2) in dogs rendered diabetic by partial pancreatectomy. He found that, if the diabetes were controlled by diet, hydropic change did not occur. If the diabetes were uncontrolled hydropic degeneration was found and the more severe the state of diabetes the more marked was the hydropic change. Allen interpreted it as a degeneration produced by functional over-stimulation of the beta cells. When the dogs were fed carbohydrate in excess of their weakened assimilative power, that is, when the diabetes was not controlled by diet, the beta islet cells were called upon to produce insulin in excess of their normal production. This over-stimulation led to exhaustion and this degenerative change. Allen (2) found that the same was true of human diabetics. Hydropic

degeneration was never found in a non-diabetic and occurred only in those diabetics in which the diabetes was not completely controlled. Allen (2) has never been able to produce hydropic degeneration by excessive carbohydrate feeding in normal animals in which partial pancreatectomy has not been done. In one experiment, glycosuria was maintained by glucose injections in a cat during the greater part of seventeen months without producing vacuolation in the pancreatic cells or other pancreatic change. On the basis of these observations, Allen states that hydropic degeneration is not a primary diabetogenetic lesion but is the result of diabetes, being due to functional overstrain of islet cells consequent upon the diabetic state. Hydropic degeneration eventually leads to death of beta cells. This affords an explanation of the downward progress of a diabetic in whom the condition is not controlled by diet and insulin. Once enough islets have been destroyed by a primary diabetogenetic lesion, such as fibrosis or hyaline degeneration, to produce diabetes, then, if the diabetes is not controlled, hydropic degeneration occurs. This results in destruction of more islet tissue, thus decreasing the carbohydrate tolerance still further, a vicious circle being established. The final scarcity of islet tissue observed at autopsy may be due as much to hydropic degeneration from functional over-strain as to destruction produced by the original diabetogenetic lesion.

From these observations it might be expected that hydropic degeneration could be found in every human case in which the diabetes was not perfectly controlled. Yet the frequency with which it was reported in diabetic necropsies, even before the use of insulin, is surprisingly small. There are two reasons for this. First, post-mortem change may simulate hydropic degeneration. Therefore, only in cases in which the autopist is certain that the hydropic appearance is not due to post-mortem change is hydropic degeneration reported. As a consequence, not only are cases due to post-mortem change excluded, but also many cases in which true hydropic degeneration is present because of lack of certainty regarding whether the appearance is due to post-mortem change or not. Second, Allen (2) points out that islet cells ordinarily survive in a vacuolated condition for a short period—perhaps a week—before breaking down, leaving no trace. In most human cases the downward progress is slow and, at any one time, only a few cells are in the stage of vacuolation. The chance if finding these few cells on examination of the pancreas is small. In experimental animals and in the occasional human case in which the diabetes is of the "acute fulminating" type hydropic degeneration is easily demonstrated.

(2) *Hyperplasia of the Islets.*

In the pancreas of the diabetic one may find abnormalities of the islets due to regenerative changes within them. Laguesse made careful measurements of the size of islets in the normal human pancreas and found that they varied from one hundred to four hundred microns in diameter. Islets exceeding four hundred microns in diameter are very rare in the normal pancreas. On the other hand, in the pancreas of diabetics one frequently finds islets larger than this. In 34 of Cecil's (1) 90 cases islets equalling or exceeding four hundred microns in diameter were found. In one case an islet was found measuring sixteen hundred microns in its greatest diameter. Not only is there an increase in size of islets, but there may be a change in the arrangement of their cells. Instead of their usual arrangement in irregular cords or masses, they may take o na definite columnar arrangement and are often packed in circular cords around the capillaries. Also the outline of the islet may become irregular due to the growth of the islet cells outward between the adjacent acini. Root and

Warren point out that evidences of such hyperplasia are particularly clear in cases of hemochromatosis. In this condition one may find the changes described above and in these enlarged hyperplastic islets may be seen cells containing no pigment and showing an occasional mitotic figure. As islet cells undergo pigmentary degeneration, new islet cells, free from pigment, are formed, and these in turn may suffer pigmentary change.

The pathology found in the pancreas at autopsy rarely represents the initial damage to the organ, but rather the result of a long struggle between the regenerative activity of the pancreas and the degenerative changes caused by the diabetogenetic factor and functional overstrain of the islet cells.

Anatomical Diagnosis of Diabetes.

Assuming that there is always some visible pathological change in the pancreas in diabetes, there are two bases upon which a diagnosis of diabetes, there are two bases upon which a diagnosis of diabetes might be made from examination of the pancreas at autopsy —(1) on the presence of a lesion specific to diabetes and (2) on the amount of destruction of islet tissue.

(1) Lesion specific to diabetes. Of the numerous diabetogenetic lesions described none is specific to diabetes. Any of them may be found in the pancreas of a non-diabetic. The reason for this is obvious. Whether or not diabetes develops depends upon the type of lesion responsible for destruction. For instance, supposing hyaline degeneration of islets be present in a pancreas. If only a small amount of islet tissue is destroyed diabetes would not have occurred during life. Therefore one cannot state that diabetes was present simply on the basis of the existence of hyaline degeneration of the islets. The same applies to any diagetogenetic lesion. Fibrosis of islets, the principal lesion associated with diabetes, is also found in a large proportion of non-diabetic cases.

Turning to the lesions produced by diabetes are those specific to the disease? Allen (2) believes that hydropic degeneration is never found without diabetes. He studied the pancreas in 549 non-diabetic cases and, although he found numerous "diabetogenetic" lesions he never found hydropic degeneration. In his experimental animals he found hydropic degeneration only in those showing diabetic signs. He states that the presence, in a pancreas, of a single cell showing unmistakable hydropic degeneration indicates the existence of diabetes during life. However, it is not a very useful criterion of diabetes since it cannot be found in so many cases of this disease. It is absent in cases controlled by diet and insulin and cannot be recognized in a large proportion of cases imperfectly controlled for reasons already given. Hyperplasia of islets is not pathognomonic of diabetes. There is no evidence that active diabetes must be present before hyperplasia occurs. Possibly minor degrees of pancreatic injury, insufficient to produce diabetes, may be followed by hyperplastic changes in the islets. Furthermore, proliferation of islet cells may be neoplastic and not compensatory in character.

(2) Amount of destruction of islet tissue. There are several difficulties attending the diagnosis of diabetes on this basis. First, the amount of tissue which must be destroyed before diabetes results in man is not accurately known. Second, an accurate estimation of the amount of islet tissue in a pancreas is difficult and time-consuming. Third, on account of the possibility of the existence of functional deficiency of islet tissue in any case, the actual functional capacity of the pancreatic islet tissue cannot be estimated by observation of the amount of normal appearing islet tissue present. However, if an inspection of several sections from a pancreas shows great destruction of islet tissue with but little normal islet tissue remaining, one would

probably be correct in diagnosing diabetes. In the presence of only moderate destruction one could only venture a guess.

In conclusion, one may make an anatomical diagnosis of diabetes in the presence of undoubted hydropic degeneration or very marked destruction of islet tissue, but the absence of these does not preclude the possibility of diabetes.

The Bearing of Pathological Findings in the Pancreas on the Aetiology of Diabetes Mellitus.

From the standpoint of the bearing of the pathology of the pancreas on the aetiology of diabetes cases are divisible into three groups.

(1) Diabetes due to hemochromatosis and acute hemorrhagic necrosis. These two conditions are disease entities of which diabetes may be regarded as an incidental accompaniment. Their aetiology is not yet settled. The aetiological problem here is that of the aetiology of diabetes since they are rare causes of this condition.

(2) Diabetes due to interlobular pancreatitis, syphilitic pancreatitis as described by Opie, focal necrosis not confined to the islets and congenital developmental deficiency of islet tissue. The aetiology of these conditions is known. Interlobular pancreatitis is due to obstruction of the pancreatic duct or to ascending infection through the duct associated with obstruction of the duct or an infective focus in the bowel. Syphilitic pancreatitis is, of course, due to syphilis. Focal necrosis not confined to the islets is the result of acute bacterial infections such as lobar pneumonia. Congenital developmental deficiency is a rare developmental defect. These conditions of known aetiology are rare causes of diabetes, only a small proportion of cases being attributable to them.

(3) The third group contains the great majority of diabetic cases, namely those in which the diabetogenetic lesions are interacinar and intra-insular fibrosis, hyaline degeneration, and Weichselbaum's atrophy with or without functional deficiency of islet cells. The aetiology of this group is not yet understood. The problem of their aetiology constitutes the main part of the problem of the aetiology of diabetes. At the present time it is impossible to say whether or not each of these three common changes—fibrosis, hyaline degeneration and Weichselbaum's atrophy—is due to a separate aetiological factor. Fibrosis may occur without the latter two, but hyaline change and "atrophy" rarely occur without fibrosis. Thus evidence of inflammatory change in the form of fibrosis is present in almost every case and one may state that the essential lesion in most cases of diabetes is a pancreatitis. Some of the factors which have been considered as possible causes of these forms of pancreatic injury will be discussed.

Arterio-sclerosis of the pancreatic vessels is a very common finding in association with interacinar and intra-insular fibrosis and hyaline change. Accordingly it has been regarded by many as a possible aetiological factor. Allen (2) reduced the arterial supply of the pancreas in experimental animals over a period of months by operative measures. By this means he attempted to simulate the reduction in blood supply consequent upon arterio-sclerosis. He found no resulting alteration of pancreatic structure. However, the reduction in blood flow through the pancreas consequent upon arterio-sclerosis is a very gradual one taking place over a period of years and is quite different from a sudden reduction maintained over a few months. To my mind, the facts which are most significant in relation to this problem are the following. First, the lesions found in the pancreas with pancreatic arterio-sclerosis are similar to those found in many diabetics without marked vascular change. Fibrosis alone, hyaline degeneration alone, or fibrosis and hyaline degeneration together may occur in both cases with and

without pancreatic arterio-sclerosis. Second arterio-sclerosis of pancreatic vessels is common in elderly non-diabetics as well as in elderly diabetics. It seems to me that the frequent co-existence of diabetes and arterio-sclerosis of the pancreatic vessels is due to the similar age incidence of arterio-sclerosis and diabetes, both being most common in persons over thirty years of age, and to the fact that the existence of diabetes predisposes to arterio-sclerosis in various parts of the body. It is very doubtful if the pancreatic changes are the result of the arterio-sclerosis.

It seems unlikely that syphilis is an important cause of diabetes.

The possibility that excessive carbohydrate feeding may cause diabetes has been much discussed. Allen has established that, once enough pancreatic injury has been done to produce diabetes, feeding in excess of the weakened carbohydrate tolerance will, by inducing hydropic degeneration, result in further pancreatic damage. Thus excessive feeding of carbohydrate may aggravate diabetes. There is no evidence that fibrosis, hyaline change or "atrophy" can result from such overfeeding, and it is doubtful if hydropic change is ever produced as a primary lesion.

One must look upon the pancreas as an organ very susceptible to injury. With each infection, in any part of the body, the pancreas may be injured. As a rule, these injuries are slight, and repeated injuries, although leaving pathological change in the pancreas, do not produce enough islet destruction to give rise to diabetes. A few, who are unfortunate enough to receive a little more injury than the rest, develop diabetes. Occasionally, the injury inflicted at any one time is so great that diabetes develops quickly. A detailed study of the various infections giving rise to pancreatic injury does not come within the scope of this thesis, in which is discussed only the bearing of the pathological findings in the pancreas on this problem of the aetiology of diabetes.

The Bearing of Pathological Findings in the Pancreas on the Clinical Course of Diabetes Mellitus.

Clinical experience has shown that increase in the severity of diabetes is dependent upon two factors: (1) dietary indiscretions, and (2) infections. The explanation of this becomes clear when the pathology of the pancreas is considered.

(1) Dietary indiscretions. If a diabetic departs from the prescribed diet, which controls his diabetes, and takes carbohydrate in excess of his weakened tolerance, hydropic degeneration and death of islet cells occur and his carbohydrate tolerance is further diminished. In this way dietary indiscretions may aggravate the diabetes.

(2) Infections. Infections may lead to aggravation of the diabetes in two ways. First, as a consequence of the passage to the pancreas, usually by way of the blood, of pathogenic organisms or toxins, there may occur destruction of islet tissue by "diabetogenetic" lesions. Any type of pancreatic injury, which can cause diabetes, can also aggravate the condition if infliction of the injury continues after diabetes has been produced. Second, the islet cells may be less seriously affected, only functional deficiency occurring from which they might recover completely after the subsidence of the infection. However, this functional deficiency produces diminution of the carbohydrate tolerance so that a diet, which previous to the onset of the infection controlled the diabetes, now cannot control it. The diet has not been altered, but the carbohydrate tolerance has decreased. The patient is now taking carbohydrate in excess of his tolerance. Therefore, hydropic degeneration with destruction of islet tissue occurs. When an infection occurs in a diabetic, the drop in carbohydrate tolerance should be anticipated and the carbohydrate intake decreased. If this be done, hydropic de-

generation will not occur and, with subsidence of the infection, the islet cells, which were rendered functionally deficient, will regain their former functional capacity. Thus, the level of carbohydrate tolerance which existed previous to the infection will be regained unless the infection itself has produced death of islet cells, instead of only functional deficiency.

Clinical experience has also shown that, if downward progress is checked by dietary control and elimination of infection as far as is possible, the carbohydrate tolerance of a diabetic may improve. This is explained by the presence of evidences of hyperplasia of islet tissue in many diabetic pancreases.

Conclusions.

(1 As far as is known at the present time, diabetes mellitus never occurs without visible pathological change in the pancreas.

(2) The following are the diabetogenetic lesions encountered:

1. Inflammatory changes with fibrosis.
   (a) Interacinar pancreatitis.
   (b) Other types of pancreatitis.
      (i) Interlobular pancreatitis.
      (ii) Syphilitic pancreatitis.
2. Degenerative changes in the islets.
   (a) Hyaline degeneration.
   (b) Amyloid degeneration.
3. Necroses.
   (a) Focal.
      (i) confined to islets—'Weichselbaum's atrophy."
      (ii) not confined to islets.
   (b) Diffuse — acute hemorrhagic necrosis.
4. Pigmentation—hemochromatosis.
5. Congenital developmental deficiency of islet tissue.
6. Functional deficiency of islet tissue.

(3) Of these diabetogenetic lesions by far the most common are interacinar pancreatitis alone and interacinar pancreatitis with hyaline degeneration of the islets. Thus diabetes is usually due to pancreatitis.

(4) The pathological changes in the pancreas found in youthful and elderly cases of diabetes mellitus are much the same. Pancreatitis is the essential lesion in both. The same is true of "hereditary" diabetes. "Hereditary" cases, that is, cases giving a family history of diabetes, are not accounted for by congenital developmental deficiency of islet tissue, but only by an increased susceptibility to pancreatitis.

(5) Two pancreatic lesions may occur as a result of the diabetes, namely, hydropic degeneration of islets and hyperplasia of islets.

(6) If diabetes is not controlled by diet and insulin, hydropic degeneration of islet cells followed by their death occurs. This hydropic degeneration is due to functional overstrain of islet cells and is the result, not the primary cause, of diabetes. It is never found in non-diabetics and in diabetics in which the disease has been controlled. It accounts for the downward progress of a diabetic case in which the disease is not controlled by diet and insulin. Hydropic degeneration may aggravate diabetes although it cannot act as the primary cause.

(7) Hyperplasia of islet tissue may occur in the diabetic. Presumably it is compensatory in character. It is not confined to diabetes. It accounts for the increase in carbohydrate tolerance occurring in diabetics in which the disease is controlled.

(8) Anatomical diagnosis of diabetes may be made on the basis of (i) the presence of hydropic degeneration of islet cells or (ii) marked scarcity of islet tissue. The absence of these does not preclude the possibility of the existence of diabetes during life since many cases do not show these. There is no "diabetogenetic" lesion which may not occur in a non-diabetic. The development of diabetes depends, not upon the type of islet lesion, but on the amount of islet tissue destroyed.

(9) There are few cases of diabetes in which the cause of the diabetes is

known. These known causes are hemochromatosis, acute hemorrhagic necrosis, ascending infection and obstruction of the pancreatic duct giving rise to interlobular pancreatitis, syphilitic involvement of the pancreas, and, in a very few cases, congenital developmental deficiency of islet tissue.

(10) The aetiological factors are not understood in the great majority of cases of diabetes, namely, those in which intrainsular and interacinar fibrosis, hyaline degeneration of islets, and "Weichselbaum's atrophy" of islets are the diabetogenetic lesions. Arterio-sclerosis of pancreatic vessels, syphilis and diet probably play no important part as aetiological factors. The probable aetological factors are infections of many types in various parts of the body producing pancreatic injury through pathogenic organisms and toxins carried to the pancreas by the blood stream. Many suffer such pancreatic injury, but in most it is insufficient to produce diabetes. If the injury does produce diabetes, it may be inflicted relatively suddenly at one time giving rise to acute diabetes, often in youth. More commonly the final injury, responsible for diabetes, is the cumulative effect of numerous injuries inflicted over a period of years, the diabetes being insidious in onset and developing in later life.

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Spinal Anaesthesia.

By W. EASSON BROWN, M.A., M.B.

Spinal anaesthesia began about thirty or thirty-five years ago, when Bier and Corning used cocaine as a lumbar injection. Until 1904 cocaine was the most popular of anaesthetic agents to produce spinal anaesthesia. Following this stovaine and novocaine, because of their relative lower toxicity, became the agents of choice and at the present time novocaine still holds the lead as the most satisfactory spinal anaesthetic we have. About 1908 Jonnesco showed that it is the nerve roots that are anaesthetized and not spinal cord centres, and further, that the anaesthetic substance used to produce anaesthesia is "fixed" by the nerve tissue in a few minutes and there is very little tendency for the solution to spread far by diffusion or gravity. This fact has been shown to be true by the action of the spinal anaesthetic. Although all patients having spinal anaesthetics are put in a Trendelenburg position after the administration, the anaesthesia does not tend to creep upwards, but remains at definite level until it begins to wear off. For many years there was an idea that if any of the anaesthetic solution by any means whatever reached the fourth ventricle where the so-called respiratory centre is situated the breath-

ing would at once stop. It is only within the last year or so that this idea has been entirely discounted. Dr. Harry Koster, of New York, makes a practice of doing all types of surgery of the head and neck under spinal anaesthesia, and his practice is followed by some others. The fact that novocaine solutions in the fourth ventricle do not cause respiratory paralysis and apparently have no effect on the respiration has been proven experimentally in the Department of Pharmacology at the University of Toronto. Professor Henderson has shown that a 10% solution of novocaine injected into the fourth ventricle of a dog had no effect on the respiratory rate or volume. It seems, therefore, that the fear of respiratory paralysis is one which is not founded on fact and that clinical trial and experimental evidence go to prove that the height of the anaesthetic solution is not of great consequence. In presenting these facts I do not wish it to be understood that I am in favor of doing high operations under spinal anaesthesia. I feel that at the present stage most operations above the draphragm which can be done with nitrous oxide and oxygen are better done that way. It may be that in time we will see spinal anaesthesia more generally accepted for high operations, but the present opinion among most of the leading anaesthetists of America seems to be that at present high spinal anaesthesia is a somewhat radical step and should be approached with caution. The great advance in the popularity of spinal anaesthesia in the past few years is due to the introduction of Ephedrin, a derivative of a Chinese plant called Ma Huang. Ephedrin has an action somewhat similar to that of Adrenalin in that it acts on the nerve endings in the vessel walls, thereby causing them to contract. The special fact about Ephedrin is that its action is much more prolonged than that of Adrenalin, although not of such an intense nature. Before the introduction of Ephedrin the administration of a spinal anaesthetic was invariably folowed by a severe drop in blood pressure, the combatting of which we knew very little. It is true that even with the use of Ephedrin we occasionally see considerable falls in blood pressure, but how much greater these depressions might have been without its use, we do not know. Another important advance seems to be the putting of the patient in the Trendelenburg position both during the following the operation. One of the greatest dangers in connection with spinal anaesthesia is cerebral anaemia. If the brain is kept well supplied with blood a moderate fall in pressure is of no importance. One must, however, remember that operative proceedures may cause at times considerable shock and the anaesthetist must differentiate between fall in pressure as a result of the anaesthetic and that which may be caused by the operation. This is a question for which no rule can be laid down, but is largely a matter of experience. The best drug we can use to combat circulatory depression is Ephedrin. If the blood depressure has not fallen more than one-third the result of the injection will usually be prompt and satisfactory. If the fall is greater than this the addition of five minims of Adrenalin added to the Ephedrin has, in my experience, never failed to be of benefit. This is particularly true if the depression is due to the action of the anaesthetic. If the shock of the operation is also entering into the picture the best proceedure seems to be the administration of intravenous saline to which ten minims of adrenalin have been added.

There is no form of anaesthesia which is absolutely supreme or entirely devoid of risk, and so, with all other forms of anaesthesia, spinal anaesthesia has its indications and contraindictions. The first most general rule might be that young and robust patients apparently react more favorably than aged and depleted patients. Moderatey low blood pressure does not seem to be a contraindication, as these patients with

the aid of Ephedrin and Adrenalin, can be carried through most operations without anxiety whereas subjects with high pressures frequently exhibit a profound fall in pressure which does not seem so readily controlled by hypodermic medication. Local or general pathological conditions of the spinal cord also seem to bar the use of spinal anaesthesia as well as the presence of syphilis.

Spinal anaesthesia has been used at the General Hospital for practically every operative proceedure below the draphram. Its most general use has been in abdominal surgery. This fact is somewhat different from the experience of most hospitals where genitro-urinary surgery and surgery of the extremities seem to be the first way in which it us used. I think our experience has been largely due to the stand taken by our surgical staff, who having some trial of spinal anaesthesia with abdominal operations, were at once taken with the perfect relaxation and ease of manipulation which could not help but be of great benefit to the patient both during and folowing operation. I also feel that the anaesthetic staff as a whole cannot but feel grateful to the surgeons with whom we have worked while we were endeavoring to evolve a technique for spinal anaesthesia which would stand the test for any operation which was to be done. We had many failures and at times it must have indeed been disheartening to the surgeon to have the anaesthesia wear off just as the crucial time in the operation approached, or at other times, at the conclusion of an intra-abdominal operation with success in sight and an easy post-operative period foretold, to have anaesthesia fade away and the peritoneum sewed under deep ether narcosis. However, I am glad to state that I think these times have gone for good and we now have a technique for spinal anaesthesia which, however far it may be from perfect, seems at least to fulfil the requirements as we see them at the present time.

At the General Hospital we use up to 300 milligrams of novocaine, depending on the length of anaesthesia required. The following is the table on which the staff roughly base their dosage of novocaine:

Time required for operation.	Amount of Novocaine injected.
20 minutes	100 milligrams
30 "	120 "
45 "	150 "
60 "	200 "
75 "	250 "
90 "	300 "

The figures for the time required may be taken as a minimum. This time can practically always be depended upon and in the majority of cases varying times longer. There is no definite time that can be set down as individuals seem to vary with the amount required as they do with general anaesthesia.

Regarding the amount of spinal fluid withdrawn, mixed with the novocaine and reinjected, this depends entirely on the desired height of anaesthesia required. The following table is the rough estimate used:

Amount of Spinal Fluid.	Height of Anaesthesia.
3 c.c.	Very low abdomen. Suitable for operations on extremities perineum, etc.
5 - 6 c.c.	Umbilicus.
9 - 10 c.c.	Costal Margin.

As a matter of practice this also is a minimum for height. Many times anaesthesia is much above the indicated areas. The policy which is followed is that it is of very little consequence if anaesthesia required only to the umbilicus reaches the costal margin, whereas a definite failure is registered if it falls low of the desired mark.

The following is the technique used for spinal anaesthesia. The patient is given Morphia grs. ¼, Hyoscine grs. 1-200, and Atrophine grs. 1-150, one

and a half hours before the operation. Three quarters of an hour before operation they are given Morphia grs. 1-8 and Hyoscine grs. 1-400. On being brought to the anaesthetic room the blood pressure is taken and three quarters of one grain of Ephedrin is given hypodermically. The patient is turned on the side and the anaesthetist in sterile gown and gloves, prepares the site of puncture with iodine and alcohol and drapes the patient with sterile draping. The patient is asked to draw up the knees as far as possible, and then having done that, to put the head as near the knees as possible. This simple direction is infinitely better than telling the patient to bow the back. A small guage needle, usually about 19, with a fairly flat bevel, is then passed into the spinal canal, usually through the third and fourth or second and third lumbar interspace. Which interspace is used seems to be of little moment. An ampule of novocaine is then opened of the desired amount and the required amount of fluid allowed to drip into the ampule. The novocaine is then dissolved in this fluid and the entire contents reinjected into the canal at the rate of about one c.c. in five seconds. The patient is then turned on the back and the table put in the Trendelenburg position. An eye mask or pair of dark glasses are put over the patient's eyes and they are taken to the operating room. The utmost quietness should prevail in the operating room and the patient should not be spoken to or encouraged to talk. They should never be asked if they are feeling pain, as this naturally implies a lack of confidence in the procedure on the anaesthetist's part. If the patient shows signs of discomfort, as frequently happens in high abdominal operations a mixture of Nitrous oxide 75% and oxygen 25% should be administered without hesitation. This treatment is also of great assistance during the transient nausea which sometimes occurs. The blood pressure must be closely watched and any considerable fall combatted by the use of Ephedrin and Adrenalin. The patient must be returned to the ward in the Trendelenburg position and the foot of the bed kept moderately elevated for two or three hours.

If the above technique is carried out there will be very few failures either in the length of anaesthesia or in the height desired.

In conclusion I would say that spinal anaesthesia is not the anaesthetic to be used for all patients and for all operations. Its field seems to be very wide, just how wide yet we cannot say. In the mean time one can say that the development of spinal anaesthesia has added a very important arrow to the quiver of the specialist in anaesthesia.

Treatment of Lead Poisoning.

By J. W. A. GREIG, M.D.

The following synopsis of the treatment of lead poisoning was taken from an article in the Industrial Hygiene Bulletin of New York State written by May R. Mayers, M.A., M.D., Bureau of Industrial Hygiene, N.Y. The treatment outined below was evolved as a result of experimental work at Harvard University which has thrown light upon the physiological and chemical reactions of lead in the body. It has been found to be very effective, indeed, in the treatment of a number of cases of lead poisoning that have come into the Massachusetts General Hospital.

With the institution of proper prophylactic measures, including adequate medical supervision of lead workers, as well as ventilation and sanitation of working places, the cases in which

acute symptoms occur, such as lead colic, the various palsies, or encephalopathy, should gradually diminish. Effort should be centred on prevention rather than cure. When a case of acute lead poisoning does arise, it is important to know the best treatment, and apply it without loss of time.

The treatment during the acute attack should be in the direction of promoting rapid storage of the lead in the bones from the blood, and of reducing any tendency to a further liberation of lead at that particular time from the bones or other points in the body where it had previously been deposited. The amount of lead in the blood may be rapidly reduced in amount by:

1. Increasing the calcium balance in the body, since a positive calcium balance favours the storage of lead. This can be accomplished by giving the patient a quart of milk plus 30 grains of calcium lactate a day. In severe cases, calcium chloride may be given intravenously in doses of 15cc. of a 5% solution.
2. The use of cathartics, preferably magnesium sulphate, in one ounce doses.
3. The use of such substances as atropine, nitroglycerine, amyl nitrate, or benzol benzoate to relieve the pain of muscle spasm in the intestines.

The use of potassium iodide is undesirable during an acute attack, since it increases the elimination of lead from the body by mobilizing the lead stored in the bones or elsewhere. It is unwise to throw additional amount of lead into the circulation when toxic doses are already present. Such a procedure may precipitate a fatal attack.

The progress of the treatment through all stages may be followed by careful observation and recording of the number of stippled red cells in a smear of the patient's blood, stained with an aqueous solution of Cresol Blue

The treatment after the acute attack has subsided should be in the direction of increasing the lead elimination from the body. It should be very slowly and cautiously removed from the storage places—especially from the bones; all of the time care being taken that too much is not thrown into the circulation at once. This may be accomplished as follows:

1. The diet should be low in calcium to establish a negative calcium balance. This is accomplished by a diet "poor in milk, eggs, green vegetables, and certain fruits." The diet suggested is: meat, liver, potatoes, tea and coffee without milk, sugar, salt, pepper, rice, tomatoes, canned corn (the latter three cooked without mik), bananas, apples (peeled), butter fat (prepared by melting the butter in hot water and skimming off the butter fat), bread prepared without milk, such as salt-free nephritic bread, soda biscuits or crackers.
2. Drugs. The acid-base balance of the body should be altered by increasing either the acid or alkali reserve since this favours the mobilization of the stored lead and helps throw it into the circulation in a soluble form. The production of an acidosis is the preferable therapeutic procedure, care being taken not to throw too much lead into the circulation at once, and with the low calcium diet above, the following are useful drugs:
   a. Dilute phosphoric acid. 20 cc. in glass of water sweetened or flavoured to remove the disagreeable taste, is given to the patient ten times a day for several weeks. The teeth should be rinsed with soda bicarb. solution after each dose.
   b. Ammonium chloride is less distasteful and is almost as effective as phosphoric acid, and is probably the best drug to use. 15 grains in a glass of water ten or twelve times daily is the dose.
   c. Potassium Iodide may be used at this stage in 3 to 5 grain doses,

three times a day, and increased gradually to the point of tolerance.

Careful watch must be maintained while using these drugs for the toxic symptoms of an acidosis. In cases of Nephritis acids and potassium iodide are contra-indicated. In these cases the alkali reserve should be increased and this is done by the administration of Bicarbonate of Soda in doses of 5-10 drams daily, and in this instance careful watch kept for evidence of an alkalosis.

These therapeutic procedures may be continued for a considerable period of time. It will be found that after a certain amount of lead has been removed from the body, it will become increasingly difficult to remove any more. When this stage is reached, eliminative procedures should cease and a positive calcium balance be established again to return the remainder of the lead to the bones for storage.

Reference: New York Industrial Hygiene Bulletin, November, 1928.

The Restoration of Tropical America.

By D. A. McFADYEN, B.Sc., M.A., 3T1.

There is no more unique historical epoch; there is no more unique example of efficient, comprehensive and daring research: there is no more unique example of restoration of civilization than that of Tropical America.

To intelligently understand the problems of this restoration a general knowledge of the topographical and meteorological conditions, and also of the indigenous inhabitants and of their living conditions, is necessary. The tropical countries may be divided into the coastal plain areas of low altitude and the mountainous districts of variable altitudes. This is of importance, for altitude directly affects the temperature and atmospheric conditions which have exercised a tremendous indirect influence on the civilization of the tropics.

The coastal plains are warm and enervating; the mountainous districts are salubrious and invigorating. There is a corresponding and striking difference in the incidence of disease.

At an early period and probably up to the discovery of America the coastal plains supported a large population, advanced in the art of agriculture and construction, and also in the science of astronomy, as attested by the extensive ruins now existing in many sections of these countries. From this time up to two or three decades ago, few roads or modern modes of transportation existed in the American tropics; and the natural waterways and primitive trails (local and limited in extent) were the only available means of intercourse between communities. There was consequently no stimulus to agriculture or industrial development, as there were no outlets for the products. The populations were mostly self-contained, and produced only a sufficient quantity of food-stuffs for home consumption.

The inhabitants became fewer in number due to disease and fear of disease, and lived a hand-to-mouth existence. There were no large centres of population, but only small villages here and there on inland waterways or at central parts.

In the mountainous districts the centres of population persisted and so civic administration was transferred there from central plains. Since access to the outer world was beset with the greatest hazazrds in the form of endemic coastal disease and limited avenues of transportation, few individuals were able to profit by the advantages to be derived from intermingling with other centres of civilization and limited progress was made in the education of the people and development of the natural resources

and industries. Furthermore, these conditions discouraged foreign settlers and investment of foreign capital.

The cause of depopulation of the coastal plains and consequently the ruin of this area and the isolation of the maintenance districts can be attributed to the introduction of yellow fever and malaria from Southern Europe and through importation of slaves from Africa. In a population non-immune to yellow fever, with no racial tolerance and possessing no known means for their prevention and care, a holocaust of death naturally followed the introduction of these diseases. Furthermore, the warm, humid climate discouraged initiative and languid contentment prevailed among the disease-ridden inhabitants as their wants were few and easily supplied. The food was locally grown and primitively prepared and consisted mainly of cereal grains, fleshy roots and fruits. The diet was frequently lacking in variety and unbalanced in character for human requirements. For some localities animals and fish were plentiful but little effort was made to utilize these sources of food.

Prior to the beginning of this century the population was subjected to hidden enemies and those able to withstand yellow fever were scourged with malarial infection. The recurring, debilitating and enervating attacks of malaria resulted in anaemia, to which almost universal hookworm infection, syphilis and malnutrition contributed, and the physical and mental deterioration of the individual was inevitable.

The realization of the significance of the mosquito as the intermediate host in the transmission of malaria and yellow fever was the foundation for the eradication of these diseases from the Tropic of Cancer to the Tropic of Capricorn. Reawakening along the lines suggested by Manson definitely proved that human malaria was transmitted by certain species of anopheles and the Yellow Fever Commission working along lines suggested by Henry R. Carter and George Steinberg definitely proved that Stegomyia (aedes calapus) was the intermediate host in the transmission of yellow fever.

The Yellow Fever Commission first came together in June, 1900, all of its members being then vigorous and healthy young men; to-day but one is living (Dr. Aristides Agramonte), the other three having died within seven years of the convention of the commission. Three army surgeons went to the source of the disease and were swept away by its effects but not before a brilliant discovery had been made.

At the beginning of the investigation there were under consideration two possible causative agents, Bacillus "x" of Steinberg, and Bacillus Icteroides of Sanarelli. Carroll and Reed had demonstrated that Bacillus "x" was an atypical colon bacillus and that Bacillus Icteroides belonged to the hog cholera group and one of the first results of the Commission was the establishment by repeated autopsies that these bacilli were, when present, secondary infection in Yellow Fever. They were unable to demonstrate them in a single case of living yellow fever, nor in the organs at autopsy of fatal cases of a long series.

The Commission was next directed to the repeated assertions of Dr. Carlos Finlay that the mosquito was a possible agent in the transmission of yellow fever. This suggestion had been before the medical profession for twenty years but the attempted experimental work of Finlay had been so confusing and contradictory that it received less and less attention. A fresh interest in the mosquito was provided by the work of Sir Patrick Manson and Major Donald Ross on the part played by the mosquito in the transmission of malaria: a work which had just been definitely substantiated in 1900.

By August, 1900, the deliberations of the Commission had evolved the primary step in the investigation—whether or not the disease could be transmitted by the mosquito. The solution

of the problem was determined and it was resolved to use human beings as experimental objects. In order to justify such responsibility the Commission, at Carroll's suggestion, determined to share the risk of self-sacrifice along with whomsoever they could secure among the non-immune for such dangerous experiments.

Carroll took the initiative and offered his arm for the first experimental inoculation of an infected mosquito, and was the first person to whom the mosquito was proved to convey the disease. Hensmeter, discussing the work of the yellow fever commission, states "in truth it may be said, that without this almost incredible self-sacrifice of Carroll the experiments would have been so hampered that it is doubtful whether any positive conclusions could have been attained." Other volunteers followed and by February, 1901, Reed, Carroll and Agramonte (Lazear had died in September, 1900,) had published the following conclusions:

1. The mosquito—Culex Fasciatus—or Stegomyia Fasciata serves as the intermediate host for the parasite of Yellow Fever.

2. Yellow Fever is transmitted to the non-immune individual by means of the bite of the mosquito, that has previously fed on the blood of those sick with this disease.

3. An interval of about twelve days or more after contamination appears to be necessary before the mosquito is capable of conveying the infection.

4. The bite of the mosquito at an earlier period after contamination does not appear to confer any immunity against a subsequent attack.

5. Yellow Fever can be experimentally produced by the subcutaneous injection of blood taken from the general circulation during the first and second days of this disease.

6. An attack of Yellow Fever produced by the bite of the mosquito confers immunity against the subsequent injection of the blood of an individual suffering from the non-experimental form of the disease.

7. Yellow Fever is not conveyed by fomites and hence disinfection of articles of clothing, bedding, and merchandise, supposedly contaminated by contact with those sick of this disease, is unnecessary.

8. The spread of Yellow Fever can be most effectively controlled by measures directed to the destruction of mosquitoes and the protection of the sick against the bites of these insects.

9. While the mode of propagation of Yellow Fever has not been definitely determined, the specific cause of this disease remains to be discovered.

In a little over one year from the convention of the Committee steps were well under way for the control of yellow fever in Cuba. The most direct and dangerous methods had been used to solve a problem when neglect had cost the United States 500,000 deaths and incapacitation in 100 years; had partially disrupted commerce, interstate and international transportation; had by the epidemic of 1878 lost the country $100,000,000; and had ruined the once flourishing civilization of the American tropics in 400 years.

The attack against yellow fever so brilliantly conceived by the yellow fever Commission was commanded by William Crawford Gorgas. Gorgas, a thorough, painstaking sanitarian, directed his attention first to Havana. It was soon realized that culex fasciatus was purely a domestic mosquito, always found in the house and in its proximity. This not only made the eradication of yellow fever simpler but greatly encouraged the sanitary staff who, until this mosquito was recognized as the causative agent, had believed that the innumerable mosquitoes might be carried hither and thither by air currents and that the task of eliminating the mosquitoes was therefore well-nigh impossible. The city was divided into districts, and each water receptacle in every home

recorded and inspected. Petroleum was poured over each water surface. Planks and fine meshed netting were employed to cover the receptacles to prevent evaporation of the petroleum and to aid in preventing the access of the mosquito to the water. The justification of this method was strikingly shown in a few months' time when the mortality from yellow fever fell steeply. The antipathy of the Spanish residents and the more or less immune native population was soon removed by the clear cut demonstration that the decrease in mortality paralleled the decrease in dead larvae collected from the water receptacles of the whole city and it became a municipal law to treat the water as outlined by Gorgas and his staff. Not only was this work a definite substantiation of the conclusions of the yellow fever Commission, but it rid Cuba of yellow fever, and with the exception of a small epidemic in 1905 there has not been a single case of yellow fever attributable to conditions in Cuba.

The triumph of Havana came at a particularly fortunate time. It answered a riddle which had puzzled the world for centuries and had caused devastation of the French attempt to build the Panama Canal. From the day when Balboa crossed the Isthmus and gazed on the Pacific the linking of the two oceans had been one of the greatest dreams of civilization. Gorgas was the first to realize the cause of the colossal failure of the French engineers and began to press the Surgeon-General of the U. S. Army, George Steinberg, with the importance of new sanitation in building the canal. This pressure resulted in his appointment as sanitary supervisor of the building of the Panama Canal.

But it was a title without function: for the government refused to supply sulphur, crude oil, nettings and other necessary equipment. They and the inhabitants still insisted that filth caused the disease and Gorgas was persistently urged to clean up the area in a routine way. He was handicapped further because Yellow Fever did not become epidemic in the Panama until 1904—two years after his appointment. When the engineers, architects and labourers began to die in 4 to 5 days of each other the full significance of the invasion of yellow fever was appreciated and Gorgas received his equipment—in 1905. Success in control of this dreaded disease was slow for he had lost considerable time by the unrestrained premature invasion of yellow fever. At last, in 1905, the tide turned, yellow fever mortality began its decrease and early in 1906 the last autopsy was performed on a fatal case of yellow fever in the Panama.

A campaign waged intensely for less than six months wiped out a scourge that had affected this region for at least 400 years. Gorgas had won the greatest triumph in the history of preventive medicine.

The domestic habits of the stegomyia mosquitoes that transmit yellow fever, rendered their destruction a comparatively simple matter, and the disease was soon eradicated from all endemic centres in the hemisphere.

Whereas Gorgas' method was so completely justified for the control of yellow fever the application to the eradication of malaria is beyond the realm of realization because the Anopheles species are semi-domestic and wild in their habits. Much can be done by short radius sanitation about small centres of population and isolated dwellings; but the universal destruction of the different species that have transmitted malaria would require expenditures that no commercial organization nor sane government would sanction. The difficulties are further aggravated by a perennially warm climate and a rainfall evenly distributed throughout the year. Therefore the Anopheles mosquito can not be eradicated through destruction in any stage of its development.

Whereas it is possible to cure malaria clinically it was not until 1926

that it was discovered that the blood of one-half of the number of such patients carried gametocytes or the sexual forms even after seven days' intensive treatment with quinine. Furthermore quinine treatment favours the appearance of increasing numbers of inocuous gametocytes in the peripheral blood of treated patients. As a result the potential infectivity of the mosquitoes was continually raised until the value of a new drug, "plasmochin," or alkyl-amino-6 — methyloxy quinoline, was realized. It is directly toxic to the sexual forms of all three types of malaria, tertian, quartan and estivo-autumnal. In a large series of cases so treated by the hospitals of the United Fruit Company in from 3 to 6 days after its first administration no gametocytes were found in the peripheral blood.

Within two years from the introduction of Plasmochin as an accessory to Quinine treatment of malaria the morbidity and mortality had decreased 10 per cent. and show a continuous decrease in the last two years.

The significance of adequate control of malaria and yellow fever is not limited to these diseases. For centuries they have undermined, debilitated and enervated the population; they have been an important factor in the lassitude, physical and mental, of an originally intelligent race; they have made possible a tremendous susceptibility to respiratory infections in a race with little if any immunity to such infections. The fevers are leaving: but their children remain in the form of Pneumonia and Tuberculosis.

Within the last ten years the main cause of death in the American tropics was Pneumonia—one-fifth of the deaths resulting from this disease. Second only to Malaria and closely approximating its death rate is Tuberculosis which causes one out of eleven deaths. The important factors behind these conditions are the prevailing illiteracy, poverty and poor housing conditions, all legacies of Yellow Fever and Malaria.

The restoration of the American Tropics has fallen from the American Government and Rockefeller Foundation to the United Fruit Co. Under the direction of Dr. W. E. Deeks they have made wonderful strides — disease is decreasing, education improving, and the rich natural resources are becoming exploited. They believe that in the next few decades the American tropics will assume an important role in the economic, political, and social affairs of the world. The natural resources are plentiful, the people are naturally energetic and able, and if the inhabitants are freed from the debilitating and enervating diseases which have retarded their progress in the past their future is exceedingly promising.

It is predicted that "within a comparatively few years the coastal plains of the American tropics will undoubtedly prove to be an important source of food supplies for an ever increasing world population."

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Indications For Splenectomy.

By IRWIN SMITH, 3T1.

The history of splenectomy is most interesting. In the Talmud there are suggestions that the spleen was removed in men and horses to increase their speed. Hippocrates' case records contain examples of splenic enlargement, and it is well known that excision of the spleen was often performed by the Greeks who thought they could improve the speed of their athletes by this procedure. The early splenectomies were performed because of the belief that the giraffe possessed no spleen, a fact to which the speed of the long-legged animal was attributed. That often, following the removal of the organ, an athlete's speed was increased, is not surprising, for the Greek athletes often had enlarged malarial spleens because of the prevalence of malaria in their country. An enlarged spleen certainly would not seem to be an aid, but rather a hindrance to athletic speed. Recently Marht and Finesilver, experimenting on rats taught to walk a tight rope, found that their speed was increased after splenectomy, and thus inadvertently confirmed the results of the ancient Greeks. They have, however, offered no explanation for this phenomenon.

Hunter in his writings mentioned accessory spleens, knew of injury and enlargement in man, and recognized that the organ was not essential to life. As early as the 16th century the performance of splenectomy is noted, having been done in a few cases for malarial splenomegaly, trauma and wandering spleen. Until relatively recent years only a few isolated cases were reported. Sakoloff compiled 65 cases up to 1889 (41 deaths). Vanverts in 1897 collected 279 cases, and Carstens in 1905, 739 cases. The operation, since that time, has been so frequently performed as to almost defy compilation.

Marked improvement in technique has caused a decided decrease in the mortality. Up to 1900 Johnston found the mortality to be about 27.5 per cent, between 1900-1907 it was only 18.5 per cent. The Mayo Clinic report covering a period from 1904-1926 (close to 450 cases) shows a mortality rate of 10 per cent. Mullin (in a small series of cases) had the very low death rate of 4.8 per cent.

Until recent years the surgeon's interest in the spleen was centered mainly in the operative treatment of traumatic rupture of the organ and the rare cases of torsion of a wandering spleen. But as the knowledge of splenic function increased and the role which it possibly played in diseases where it was enlarged better understood, the surgical mind was encouraged to attempt the removal of the organ in cases of splenomegaly. A phase of what can be termed experimental surgery set in; splenomegaly and the effect on the course of such diseases was carefully studied in many series of cases. Sufficient data has now accumulated to permit a review of the subject with a measure of confidence whilst recognizing how far we are from anything approaching finality.

Excluding purely surgical conditions such as trauma and torsion of a wandering spleen, what is the indication for and results of splenectomy? The spleen, as is well known, is a hemolymph gland belonging to the reticuloendothelial system, and because it is only one of a large group of similar tissues, its removal causes little or no alteration in the functions of the body. The spleen reaches its height at puberty and gradually becomes obsolescent, so that at middle age it has little or no function (as far as we know to-day). Most of the diseases with which it is associated occur between puberty and middle age.

Splenomegalies may be divided into two main types:

(1) Primary Splenomegaly — where there seems reason to believe that the actual cause of the condition may be in the spleen, or at any rate that the spleen forms some vital link in the production of the signs and symptoms This form is examplified by Banti's disease, purpura haemorrhagica and hemolytic jaundice.

(2) Secondary Splenomegaly—where the splenic changes are but part and parcel of a more general change throughout the whole body, as in pernicious anaemia, the leukemias, polycythemia vera, etc.

In the first group it is reasonable to expect that splenectomy may be of value. In the second group it is unreasonable to expect splenectomy to be of value (in spite of certain reports to the contrary) and therefore it is definitely contra-indicated. It is interesting to note in the literature the recent change from indiscriminate to selective indications for the performance of splenectomy. Formerly operative intervention in diseases associated with splenic enlargement, was largely based upon empiricism but now clinical observations have placed the established operative procedures in a well fortified position. It is, however, necessary to distinguish carefully between the thoroughly justifiable and well-established indications for surgery and those which are doubtful and have little or no support to them. Since surgical operations on the spleen are mainly associated with splenomegaly which in turn may be identified with general blood diseases, a careful study of the clinical findings and microscopic investigations of the blood are required before surgical intervention is to be advocated.

The indications for splenectomy are few and are summarized as follows:

1. Traumatic lesions.
2. Banti's disease (Splenic anaemia).
3. Hemolytic jaundice.
4. Purpura haemorrhagica.
5. Mechanical reasons.
   (a) Movable or wandering spleen.
   (b) discomfort due to enlargement in—
      (i) Gaucher's disease,
      (ii) Malaria,
      (iii) Cysts and tumours (benign or malignant)
      (iv) Kala azar and other tropical splenomegalies.
6. Rare indications:
   (a) Tuberculosis.
   (b) Syphilis.

Traumatic Lesions.

Frequently result from crushing or penetrating injuries. It is almost impossible to definitely diagnose an injury to the spleen but any suspicion of an internal haemorrhage demands exploration and if the spleen is the source of the bleeding splenectomy is indicated.

Banti's Disease (Splenic Anaemia)

Most authorities are now in agreement that the two names given above are synonymous.

Etiology.

(a) No definite cause has as yet been discovered.
(b) All evidence points to there being a primary infection in the spleen which causes the characteristic pathology.
(c) Cultures of 82 operated cases (Mayo Clinic) were all negative.

Clinical Picture.

The disease is one of adult life and can be divided into 3 definite stages according to the symptomatology.

1st or Pre-ascitic stage—characterized by secondary anaemia and splenomegaly, duration 3-5 years.

2nd or Intermediate stage—duration several months.

3rd or Final stage—additional development of signs and symptoms of portal cirrhosis of the liver, duration 1-2 years.

1st or Pre-Ascitic Stage.
The symptoms are:

(1) onset insidious.
(2) gradual increasing weakness, fatigue and pallor.
(3) onset of digestive disturbances.
(4) abdominal discomforts and pain, may direct the patient's attention to the splenic enlargement.
(5) haematemesis (in a large percentage of cases).
(6) diarrhoea and melaena (in a small number of cases).

Physical examination reveals

(1) pale individual (adolescent or young adult).
(2) large, firm, smooth spleen, often tender.
(3) mild temporary ascitis may be present (following attacks of abdominal pain).
(4) occasional bouts of slight fever.
(5) blood picture of a moderately severe secondary anaemia.
(6) platelet count is very important.

Howell Evans and Rosenthal divide the disease into two groups.

(a) Thrombocytopoenic — those cases in which the platelet count is very low before operation and rises to about normal afterwards. These show haemorrhagic tendencies.
(b) Thrombocythaemic — cases in which the platelets are not definitely diseased but are normal or almost normal in number before operation and rise to a very high level after splenectomy. Haemorrhages are less marked or absent.

2nd or Intermediate Stage.
Additional findings.

(1) hepatic enlargement.
(2) icteric tinge.
(3) passage of scanty high coloured urine containing an excess of urobolin.
(4) positive indirect Van den Bergh reaction.

3rd or Terminal Stage.

(1) small cirrhotic liver.
(2) jaundice.
(3) recurrent painless ascites.
(4) progressive weakness and anaemia.

Results of Splenectomy.

(1) On the whole have proven to be most gratifying.
(2) Best results are obtained when the operation is undertaken in the 1st or 2nd stage. The operative mortality is less than 15 per cent. and complete cure is likely.
(3) In late stages the operative mortality is almost 50 per cent., but marked improvement may be effected in patients surviving the operation.
(4) Mayo Clinic reports the largest single series (82 cases), some in the late stages, with only a 10 per cent. mortality.
(5) It has been repeatedly noted that whilst in one case success follows splenectomy in another equally early case death follows the operation, the cause of death being frequently mesenteric thrombosis.

Howell Evans and Rosenthal, as already stated, have divided cases of Banti's disease into two groups, according to the platelet count. The great practical importance of this division is demonstrated by the following fact, namely, that cases of the thrombocytopoenic group respond well to splenectomy whereas those of the thrombocythaemic group show a marked tendency to thrombosis after removal of the spleen. Fortunately the cases of the second group are rather rare. After splenectomy there is a marked, if only temporary, rise in the platelet count which would predispose to thrombosis.

Hemolytic Jaundice.

Etiology—still obscure.

Clinical Picture.

(1) moderate splenic enlargement.
(2) definite icteric tings of skin and conjunctiva.

(3) absence of bile in the urine and the presence of bile in the stools.
(4) positive indirect Van den Bergh reaction.
(5) Increased fragility of the r.b.c.
(6) Schneider's test is positive. (Bile recovered from the duodenum by a tube shows an increased amount of urobilin and the presence of urobilinogen.)
(7) Tendency to pigment gall stone formation. This is possibly explained by the fact that large numbers of red blood corpuscles are destroyed. excess of bile pigment is found, and hence the tendency to gall-stone formation. At the Mayo clinic 60 per cent. of 72 cases of hemolytic jaundice coming to operation had gall stones. This suggests how a difficulty in diagnosis may arise, as such cases often suffer from biliary colic and even obstructive jaundice superimposed on the hemolytic type.

Results of Splenectomy.

(1) Splenectomy is the only treatment for hemolytic jaundice. The relief following operation in this condition is so dramatic as to be almost unbelievable.
(2) Immediately following splenectomy all the signs and symptoms disappear, life-long jaundice is banished and a remarkable improvement in the general health occurs.
(3) The operative mortality is low, 2.9 per cent. in 137 cases collected by Krumbhaar. Mayo clinic report 72 cases with a 5.5 per cent. mortality.

Purpura Haemorrhagica.

Etiology. Obscure, but two ways in which the diminution of platelets can occur have been suggested. Possibly both factors contribute.

(1) Destruction or depressed activity of the megakaryocytes of the bone marrow with or without similar action on the other elements of the marrow. The spleen is suggested as the origin of an inhibitory agent having a specific effect on the platelet forming centres, and thus depressing their activity.
(2) Rapid destruction of the platelets in the circulation or in some organs of the body, especially the spleen. The platelets are not actually destroyed but tend to clump in the internal organs, principally the spleen.

Clinical Picture.

(1) Acute, chronic and intermittent forms occur. The chronic variety is the commonest.
(2) The average duration of an attack is from one to two months. In the chronic form the patient is subject to attacks for years, being well in between attacks.
(3) The patient is usually pale and asthenic.
(4) Cutaneous and mucous haemorrhages (nose and mouth) of varying severity occur.
(5) Recurrent fever is common.
(6) Splenic enlargement.
(7) Low platelet count.
(8) Prolonged bleeding time.
(9) Failure of clot to retract.
(10) Normal clotting time.
(11) The appearance of petechiae in the skin of an extremity below an elastic tourniquet so applied as to retard the venous return but not to interfere with the arterial inflow.

Whipple insists on the last five findings before accepting the diagnosis.

Results of Splenectomy.

1. Splenectomy in purpura haemorrhagica is classed as one of the triumphs of modern surgery.

2. The patient regains a sense of health and well being, the pallor disappears, bleeding from skin and mucous membranes ceases, the bleeding time returns to normal and the platelet count rises from almost zero to normal or even above it.

The other indications for splenectomy are rather rare and it is not the

object of this paper to enter into detailed descriptions of the clinical features.

Mechanical Reasons.

(a) Movable or Wandering Spleen.

If symptoms referable to the spleen develop — the diagnosis is extremely difficult — operation is advisable. Torsion of the pedicle, when it occurs, demands operative intervention. Many writers have never seen a case because of their rarity. Mayo Clinic report 3 cases in 450 splenectomies over a period of 22 years.

(b) Discomfort Due to Enlargement.

At present a controversy exists as to whether a large spleen which causes discomfort should be removed by operation or treated by radium or X-ray therapy. Splenectomy removes the enlarged organ but has little or no effect upon the associated disease. Occasionally there is a very definite improvement in the patient's general condition (due to the removal of the spleen which acted as a focus of infection) as well as a relief from the local discomfort due to an enlarged spleen. This holds for malaria, Gaucher's disease and kala azar, etc. Cysts (hydatid of echinococcus) and primary tumours of the spleen (benign or malignant) are seldom met with and are regarded as surgical curiosities. If they cause symptoms and a diagnosis can be established, surgical extirpation of the spleen is desirable.

Rare Indications.

(a) Tuberculosis of the Spleen.

In primary tuberculosis of the spleen it offers the only relief. In secondary tuberculosis of the spleen splenectomy should never be done. Primary splenic tuberculosis occurs either in the form of multiple caseating nodules in a slightly enlarged spleen or as a diffuse fibrous hyperplasia with considerable enlargement of the organ. This may constitute the one important active tuberculosis focus in the body. In such cases, almost all in children, splenectomy results in a rapid disappearance of the signs and symptoms. According to Wilkie "it is but right, therefore, where the splenic enlargement is associated with fever and no other gross tuberculous lesion can be discovered to consider the question of splenectomy."

(b) Syphilis of the Spleen.

Mayo was the first to direct attention to the fact that the spirochaetes may lodge and develop in the splenic substance defying all specific drug treatment. The spleen is usually firm, fibrotic and just palpable. Removal of the spleen in such cases will permit of rapid cure by medicinal measures.

Contra-Indications to Splenectomy.

Splenectomy is definitely contra-indicated in pernicious anaemia, the leukemias, polycythemia vera, the acute infections, Hodgkin's disease, hemophilia, cirrhosis of the liver, amyloid degeneration of the spleen and numerous other conditions for whose attempted cure splenectomy has been performed.

Although the spleen is an important repository of reticuo-endothelial tissue, this is widely distributed elsewhere in the body and possesses marked regenerative and compensatory properties which are called into activity by splenectomy. This fact is part explanation at least for the failure of splenectomy to maintain a permanent blood effect either in health or in the above mentioned disease conditions associated with splenomegaly.

In pernicious anaemia removal of the spleen was extensively practised without convincing improvement (as far as many authorities see it) but the introduction of dietetic treatment has so improved the outlook as to render further discussion of splenectomy unnecessary.

Conclusions.

1. Before recommending splenectomy one must be satisfied that
   (a) Medical cure cannot be expected.
   (b) Prospects of a surgical cure are

sufficiently good to warrant the immediative operative risk.

2. In traumatic lesions and other rare conditions, e.g., torsion of a wandering spleen, surgical intervention can be carried out if necessary.
3. In the treatment of certain diseases characterized by splenomegaly, splenectomy has an established place, namely, Banti's disease, hemolytic jaundice and purpura haemorrhagica.
4. In certain conditions it may be carried out with benefit in selected cases, namely, for mechanical reasons, tuberculosis and syphilis.
5. In all other forms of disease mentioned splenectomy is definitely contra-indicated and is of no value. The clinical results have not justified the operation.
6. The mortality of splenectomy does not exceed 10-15 per cent. of the total operations but varies with the selection of the cases and the skill of the surgeon.

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Pages from the Student's History of Medicine

[There are many ways of writing history, all of which are stereotyped; or rather, all but one. The publication of 1066 and All That has demonstrated a new and utterly memorable historical method. It is to the authors of that (memorable) work this humble essay is (without permission) dedicated.]

CHAPTER XXX.

The Second Half of the Nineteenth Century.

This was a time of great inventions, the first being the Medical Curriculum, which was to deal with all the others. Any new invention was immediately put on the "Index Medicus" and had to be learnt by students. This was a Good Thing, as it caused the invention of students.

Rise of Surgery: Puffing Billy.

Surgery has been getting invented in pictures since the time of Galileo, the romantic Arabian anatomist, who made holes in skulls by dropping stones on them from the tops of towers. But it was a dirty business, and surgeons were very bad until the famous Scottish doctor, Puffing Billy,* reformed them in a strong speech, in which he told them "to take off their blood-stained coats and wash," thus making surgery a comparatively clean business.

Invention of Ether.

Osler invented Ether, which was a jelly that filled in empty space and allowed vibrations. It was useful to surgeons and dentists, because they could use it to fill in the holes they made, thus making surgery a comparatively easy business.

* Afterwards Lord Listerine.

Continental Jealousy.

The Germans were so annoyed with the success of English (and American) speaking races (in England and America) that they invented Germs, thus causing the German Theory, which said that diseases were caused by T. B., K.L.B., V.D. (a sort of worm), R.D., C.O.D., etc., etc. This was followed by waves of meetings where everybody said that the other people's diseases weren't true and theirs was.

Kock: The Second Animal Experiments.

The first animal experiments were done by Jenny, the romantic English cow-girl, who stopped a scourge of smallpox vaccing too great by giving it to hens thus inventing chicken-pox. Kock, the memorable German, made rules for animal experiments called—

Kock's Four (4) Preposterates.

These were:

(1) Any animal that had a germ must have a disease.

(2) If any disease was not due to a germ, no animal was to have it.

(3) No disease was allowed unless an animal had had it, and the player must miss his (or her) turn and go back to the start.

(4) Was the same as (1).

This was a Good Thing, as it consumed rats, mice and stray cats, thus causing Animal Consumption.

Fearcough And Watchmecough.

Kock said T.B. was the cause of spitting and coughing. Naturally this was denied by Fearcough, the Kaiser's doctor, and the memorable mad Russian Watchmecough. Kock invited them to a meeting and showed it was true. As

they left in disgust Kock cried, "They came to scough and went away!"

The Wassermann Ructions.

All these meetings annoyed the Church, because they had suffered enough of that sort of thing with the Origin of Speeches.* and when Ehrlich, a native of the town of Wassermann, said he could cure V.D. (a sort of worm), the Church said it was not a thing to talk about, but the Wages of Sin. Ehrlich, however, defeated it with his utterly memorable Six Hundred and Six Arguments.†

Pasteur: One of Nature's Doctors.

Pasteur was a brewer who kept silkworms and pretended he was a chemist. One day he saw a boy bitten in the ventricle (or stomach) by a great Claude Bernard dog, and saved him from the Ravies (synoyms: Shouties, Singies, Talkies or St. Bitus' Dance) with a single hair of a mad dog. This memorable success caused French science to spring up everywhere, and lots of animals were used by Gengou, Joujou, Hibou, Roux, Yersin, Bassin, Malsain and Rein (and Yersin), who were called the Bawdy School, because they were French and probably went to Folie Brightique (or Ruban Vert), a memorable place of relaxation for Parisians.

The New Science and Health Society.

In England, prominent people said anyway British scientists weren't going to behave in a licentious French manner, so they founded the utterly eddyfying Anti-Vivacious Society, which said there was no such thing as disease, and anyway they could cure it by not believing in it and letting the bowels do as they liked, and dumb animals were a good deal better than scientists (who were not dumb; see Origin of Speeches, supra).

This gave Pasteur a stroke, and his last invention was the memorable phrase, "Cochons sceptiques" (pigs of unbelievers). The famous Anti-Sceptics were founded in his memory (Lord Listerine, Milton, Lysol, Jeiz, the first Jew to receive the C.M.B., and Yahdil, afterwards excommunicated by the Pope because he smelt of garlic).

(Chapter Pass . . .)

CHAPTER XL.: THE LAST.

The Medical Curriculum was now too full, and students said it was a Good Thing, because Medicine obviously was no longer memorable. So they played football instead.

Reprinted from St. Bartholomew's Hospital Journal.

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* See "Darwin and the Theory of Elocution," 1066 and All That.

† Argument 606: "The ehrlich bird catches the worm."

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Book Notes.

LEONARDO DA VINCI, The Anatomist, by J. Playfair McMurrich, The Carnegie Foundation, Washington.

THE world of science and the world of art have never known a broader genius than Leonardo. Imbued with an insatiable curiosity regarding all the manifestations of nature, the brilliant intellect of this man, painter, sculptor, architect, engineer and anatomist, shed on every subject into which he delved, a piercing and revealing light.

Dr. McMurrich in writing of one aspect of his many-sided brilliance, has given us a scholarly and learned book, accurate in detail and broad in scope. He traces the development of the science of Anatomy from earlier times to Galen, from Galen through the Arabs and back to the Europe of the fifteenth century, where, previous to the Renaissance a kind of corrupt Galenism existed, to which, since Galen's time little had been added and from which much had been lost.

Thence, having established the spirit of the times, the forces which had been at work, and the awakening of interest in things cultural and scientific, and having pictured the environment of Leonardo's early life, the writer proceeds to his main subject and brilliantly exposes the development of Leonardo's science, his rise from the Galenic rut, with his occasional fall into the mysticism and dogmatism which had blanketed Europe for thirteen centuries. He shows Leonardo, by the sheer force of his powerful and inquiring mind, unbiased by any medical knowledge, and with his unsurpassed faculty of close and accurate observation, unveiling more completely than any man had formerly done, the mysteries of anatomical science with notes and drawings, the accuracy of which, when compared with anatomical illustration of to-day, is truly remarkable.

We sincerely feel that every medical student should know this book; but particularly do we recommend it to those interested in the history of medical science and in the study of anatomy. We recommend it, not only because its author is one of our most esteemed and respected teachers, and more pre-eminently fitted, technically, historically and aesthetically than any other man on the continent for this work, but because in itself it is an intensely interesting and valuable study of one of the world's most fascinating figures. Beautiful binding, printing and illustrations will attract the one who is interested in a notable addition to his library.

THE STORY OF SAN MICHELE, by Axel Munthé. E. P. Dutton & Co., N.Y. $3.50.

DR. MUNTHE, disciple of Charcot, neurologist, fashionable practitioner of Paris, physician to royalty, and friend of the lesser people, writes with keen insight and humour of incidents in a varied and interesting life. From the tale of Archangelo Fusco, the organ grinder in the slums of Paris, we are taken to the sunshine and serenity of Capri and the Mediterranean; from the brightness and peace of the Paris Hospital and Sœur Philomène to the vivid horrors of the plague at Naples.

Fantasy, humour, keen observation and insight, and a deal of human philosophy combine to make this a vastly entertaining and fascinating book, and excellent relaxation from text and note book.

A.

A.D. 1853 . . . . . N° 365.

Deodorizing Cod-Liver Oil.

LETTERS PATENT to Sir James Murray, Knight, Doctor of Medicine, of Dublin, for the Invention of "IMPROVEMENTS IN DEODORIZING COD LIVER OIL, IN RENDERING IT MORE AGREEABLE AND EASIER TO USE, EITHER BY ITSELF OR MIXED, AND SO AS TO BE CAPABLE OF BEING ADMINISTERED IN LARGER QUANTITIES AND WITH GREATER SUCCESS."

Sealed the 13th April 1853, and dated the 11th February 1853.

PROVISIONAL SPECIFICATION left by the said Sir James Murray at the Office of the Commissioners of Patents, with his Petition, on the 11th February 1853.

I, Sir JAMES MURRAY, Knight, Doctor of Medicine, of Dublin, do hereby declare the nature of the said Invention for "IMPROVEMENTS IN DEODORIZING COD LIVER OIL, IN RENDERING IT MORE AGREEABLE AND EASIER TO USE, EITHER BY ITSELF OR MIXED, AND SO AS TO BE CAPABLE OF BEING ADMINISTERED IN LARGER QUANTITIES, AND WITH GREATER SUCCESS," to be as follows: —

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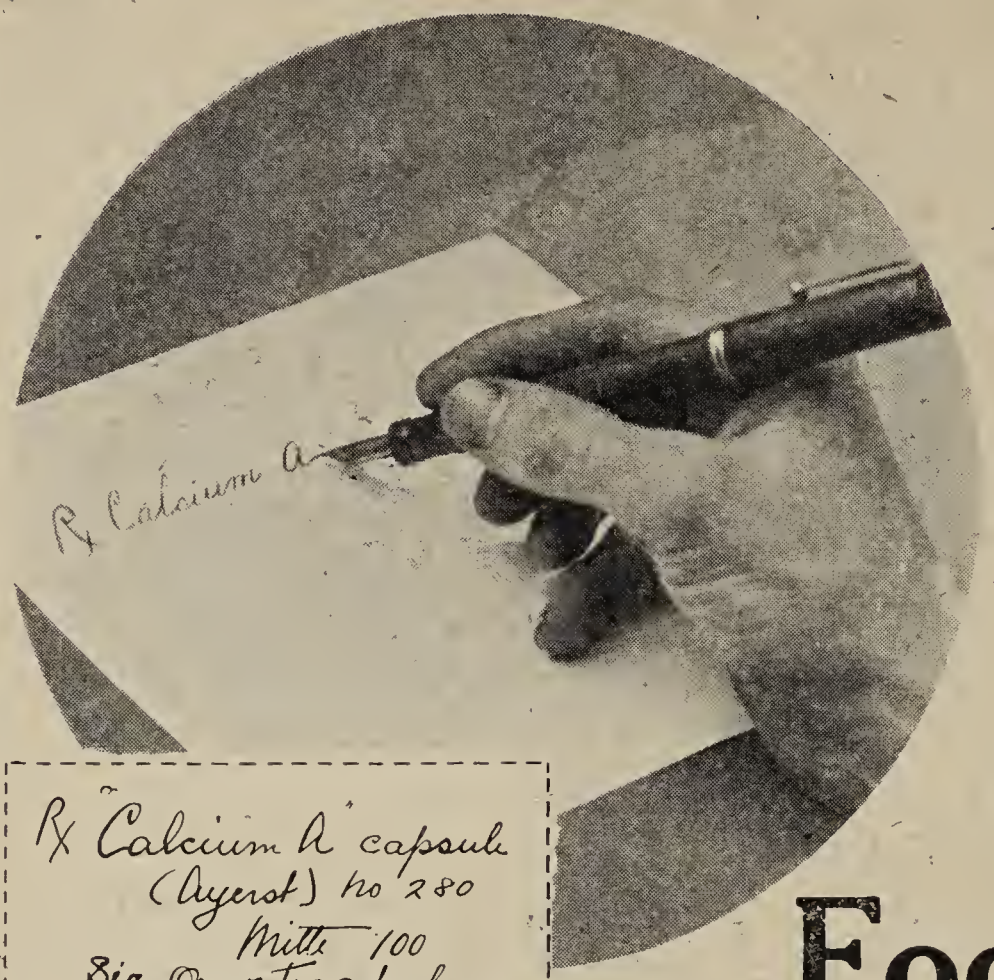

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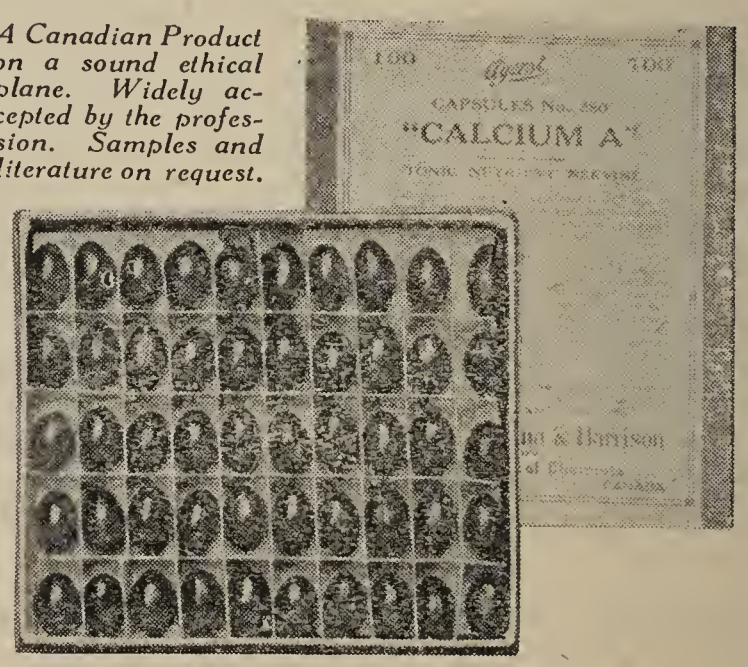

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